DOCUMENT RESUME

ED 024 534 RE 001 476

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Pub Date 68

Note- 16p.

EDRS Price MF- $0.25 HC- $0.90

Descriptors- *Consonants, Elementary School Students, *Oral Reading, Phonics, *Readability, *Vowels, *Word Recognition

The relative importance of vowels in reading versus the relative importance of consonants was investigated by comparing the scores on the oral reading of a passage from which all vowels had been removed with the scores on the oral reading of the same passage from which all consonants had been removed. Scores for reading the passage with whole words were also recorded. Subjects were 128 Boston elementary summer school pupils and a small group of adults. It was found that the passage without the vowels was much easier to read than the passage without the consonants. A review of related studies and a discussion of implications for phonics teaching systems in beginning reading and for alphabet reform are given. Tables and references are included. (Author/CM)

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ABSTRACT

The oral reading of one passage in which all vowels had been removed was compared with the oral reading of one passage in which all consonants had been removed. The subjects were 128 Boston elementary summer school pupils and a small group of adults. It was found that the passage without the vowels was much easier to read. This finding, though in harmony with early word recognition studies, does not overlap them and it may have some implications for the order and emphasis of phonics teaching systems for beginning readers and for those interested in alphabet reform.

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READING WORDS WITH VOWELS MISSING AND WITH CONSONANTS MISSING[1]

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The purpose of this study was to determine the relative importance of vowels in reading versus the relative importance of consonants.

Theoretical Considerations

This problem has some theoretical importance in that there are historically interesting studies to determine which part of a word is more useful in transmitting information to the reader. Anderson and Dearborn (1952) cite studies done by Hughey in 1898 which show that the first half of a word is more important than the second half and later, in 1908, Hughey showed that the top half carried more information than the bottom half. This finding, plus the study by French, Carter and Koenig cited by Miller (1951), which shows that more consonants are used at the beginning of the word, have direct bearing on this study.

The information transmission of the general configuration of a word has been known for some time. Woodworth (1938) tells us that Catell showed the importance of "total word picture" in 1885 and Erdman and Dodge in 1898 emphasized

"general shape of words."

The internal characteristics of word recognition were studied a bit later when Zeitler in 1900 felt that dominant letters were important and Messmer in 1903 was concerned with vertical strokes and curved letters. A study similar to the present one was done in 1897 by Pillsbury who presented typewritten words with 1) a letter omitted, 2) a false letter substituted, or 3) a blurred letter. Omissions were easiest to see and blurred letters the most difficult, with more misprints seen at the beginning of the word.

Later work on word recognition in reading seems to be concerned with familiarity. Gray (1960) notes that Tinker in 1929 found that recognition span increases if the letters are in meaningful configurations, while Russell and Fea (1963) cite the Solomon and Postman study of 1952 which shows that the frequency of usage of words reduced the recognition threshold.

Whereas earlier studies might be loosely grouped as being concerned with perception or whole versus part recognition, some of the later studies have been influenced by information theory and in particular the notion of redundancy. In 1948 Shannon calculated that English was about 50% redundant -- that is, about half of a printed message could be removed and

still it could transmit the same message. Later he calculated that English was 75% redundant (Shannon, 1951). Chapanis (1954) attempted to verify this by omitting letters and spaces, both randomly and in patterns. He found that if there was a 10% deletion of letters and/or space units, then 80% of the removed units could be replaced by subjects studying the deleted text. If half of the text was deleted then less than half of the deleted units could be replaced. Miller and Friedman (1957) also did a number of deletion experiments with printed text and found that "the most successful procedure for coherent abbreviation that we have found is to omit the space (between words) and all vowels." (p. 54) This resulted in a 48% abbreviation and 6 subjects were able to replace 93% of the omissions and some could replace 100%. This finding tends to verify Shannon's first calculation of 50% redundancy. It might be noted that these studies were done with adults and without tight time limits.

This study might also be thought of as a type of letter unit cloze procedure rather than the more common word unit cloze procedure developed by Taylor (1953).

It is the linguists, however, who have called our attention to the consideration of written forms. Cherry (1966) states that Hebrew and a number of other ancient languages are written with only consonants. Modern Hebrew reading is taught

to children with vowels present but these are vanished as the student matures. Even though Hebrew has many grammatical characteristics which are different from English, one of the objectives of this study is to examine the extent to which children can read English without vowel symbols. A partially relevant bit of information is that abbreviated English shorthand forms more often omit vowel symbols than consonant symbols.

Practical Considerations

One of the important practical considerations of this study is the teaching of phonics to children. Some phonic teaching systems emphasize the vowel sounds first and consonants later. Most phonic systems devote more teaching time to vowel sounds than to consonant sounds. Likewise, phonic diagnostic tests tend to reflect prevailing curriculum emphases.

This study was done as part of a project which is designed to computerize certain reading testing and teaching procedures, including phonics. Since there is little precedent for teaching phonics by Computer Aided Instruction (CAI) it is perhaps well to reexamine basic assumptions. We certainly do not think that this study will be able to answer conclusively methodological and diagnostic questions but it might contribute some information and serve to open

up the basic question of whether or not the early and/or heavy emphasis on teaching vowels in various phonic systems is justified.

In addition to active discussions and some experimentation on the relative merit of phonic or "code cracking" systems some experimentation has been done with various revised alphabets. The felt need for greater accuracy, particularly in vowel usage, occupies major prominence in some revised alphabets, such as the ITA.

METHOD

A short passage of 54 words, placed by readability formula (Fry, 1968) at second grade level, was selected. This passage was presented to the students in three forms:

Form 1, also called Vowels Only, had every consonant in every word substituted with a + sign.

Form 2, also called Consonants Only, had every vowel of every word substituted with a + sign.

Form 3, Also called Whole Word, had every vowel and consonant present.

The different forms were presented on separate sheets of paper for 30 seconds each and the student was asked to try to read the words aloud. The score on each form was the number of words read correctly.

The bulk of the population was 128 elementary school students attending the summer session in disadvantaged areas of the Boston public school system. Though the students were mostly Negro and the economic level of their neighborhoods something less than that of the typical white suburb, the schools were not in "hopeless slums." Despite a wide sp ead in abilities and in chronological ages, the students were enrolled more for enrichment than remediation. As the data show, most of the children could read orally the material presented in whole word form. For a few of the children scores from the California Reading Test, Elementary Form, administered within two weeks of the study, were available.

In our sample of material the Vowels Only Form had 41% and the Consonants Only Form had 59% of the total letters present.

The testing was done by the author and four teachers from the Boston public schools participating in a Title III project related to CAI.[3]

In addition to the children a small group of adults was also tested.

Insert Figure 1 about here

RESULTS

The major finding of this study was that words with consonants only were much easier to read than words with vowels only. Most children could not read any words with vowels only, though a few could read several vowel-only words. The average score on the Vowels Only Form was .1 word. Most students could read a few consonants-only words. The average score on the Consonants Only Form was 2.6 words read in a 30-second period.

As a control, to ensure that the passage lay within the reading ability level of the students, we asked them to read the passage printed in whole words. The average child read 36 words in 30 seconds. The finding that younger children read less words than older children was due more to time limitations than ability to correctly respond to the words. But the mean score of 24 words on the Whole Word Form for the youngest age group, the seven year olds, was well beyond the consonats-only score. As a further check on reading ability we were able to obtain California Reading Test scores of 20 children in a school which had children in grades three through six, and found that the mean score was 4.3, with a range of 2.5 to 7.4. Hence we are certain that nearly every child

could read the whole words.

It might be of some interest to note that these summer school children have not progressed one grade level for each year of chronological age.

In testing a small group of adults we found the same extreme variation between the ability to read with vowels only present and the ability to read with consonants only present. We also found that the adults did very much better than the children in reading both forms of altered words. There was some suggestion that the adults' abilities tended to be bimodal, that is, they could either read the consonants only section with greater facility or else they were slow and hesitant.

Insert Table 1 about here

DISCUSSION

The finding that words with consonants only are easier to read than words with vowels only is in harmony with what one might infer from the earlier studies which mentioned that there are more consonants at the beginning of words and that seeing only the first half of the word made it easier to read than seeing only the second half. It is also in harmony with the fact that Hebrew is

written, and can be read, without vowels and that shorthand forms more often omit vowels than consonants. This study confirms the Miller and Friedman finding with adults and shows in addition that there is at least the same tendency with children.

This may mean that phonics systems used with beginning readers should emphasize consonants more than vowels, or at least emphasize consonants before vowels. However, this implication needs additional research.

The finding that adults can read words with vowels missing much better than children and that some adults can read at least simple material with facility is in harmony with the studies of Tinker and Soloman and Postman which found familiarity to be an important factor in word recognition.

This study may also have implications for alphabet and spelling reform. If vowels make less important contributions to word recognition -- indeed, if children and adults can sometimes read words with no vowels at all-- then perhaps spelling and alphabet reformers should not be too concerned if a given vowel symbol does not exactly match a given vowel sound.

As might be expected, a range of individual differences was observed, particularly in ability to read the

Consonant Only Form. It is possible that this is a different method of measuring a type of language ability that might be used in further research of diagnostic procedures.

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FOOTNOTES

[1] This study was prepared in part with funds from Grant No. OGE-0-8-085762-2502(056) between the USOE (Title III) and the Boston Public Schools which subcontracted with the Harvard University Computer Aided Instruction Laboratory, L. M. Stolurow, Principal Investigator.

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[3] Teachers participating in the study were Frank Galvin, Alice Healey, Ann Hennessy and Dorothy Lesser.

TABLE 1

Total Words Read Orally with Vowels Only, Consonants Only, and Whole Words, Shown by Age Group

Age	Grade[b]	N	Vowels Only	Consonants Only	Whole Words
7	2.0	9	.1	1.9	24.7
8	2.5	34	.0	2.1	28.6
9	3.2	28	.2	2.1	41.0
10	3.9	27	.2	2.8	37.0
11	4.6	21	.1	3.0	40.9
12	5.2	6	.2	3.2	42.7
13	6.0	3	.0	2.7	47.3
Average	3.5	c	.1**	2.6**	36.0**
Adults[a]	14.8	5	1.5	30.5	54.0

[a] Adults not included in averages.

[b] Years of education completed.

[c] Total N for children was 128.

** $p < .01$

FIGURE CAPTION

Fig. 1. Complete test of passages shown for 30 seconds each to every subject.

Form 1: Vowels Only

I+ +ou+ +a+++oo+, ++e+e a+e ++o +ea++ ++a++. O+e i+ ++e +u+. +ou +a+ ++i+ i+ i+ a++ ++a++ +ou+ +ea+ o+e+. ++e o++e+ +ea++ ++a+ i+ +ou+ +e+i+i+e +a+i+e+.

+ou+ +e+i+i+e +a+i+e+--a +ea++ ++a+? ++a+ +ou+++ +++a++e. ++e ++u++ i++i+e i+ i+ +u++o+e+ +o +u+e +ou. I+'+ +o+ +u++o+e+ +o +i++ +ou.

Form 2: Consonants Only

+n y++r b+thr++m, th+r+ +r+ tw+ d++th tr+ps. +n+ +s th+ t+b. Y++ c+n sl+p +n +t +nd cr+ck y++r h++d +p+n. Th+ +th+r d++th tr+p +s y++r m+d+c+n+ +b+n+t.

Y++r m+d+c+n+ c+b+n+t--+ d++th tr+p? Th+t s++nds str+ng+. Th+ st+ff +ns+d+ +t +s s+pp+s+d t+ c+r+ y++. +t's n+t s+pp+s+d t+ k+ll y++.

Form 3: Whole Words

In your bathroom, there are two death traps. One is the tub. You can slip in it and crack your head open. The other death trap is your medicine cabinet.

Your medicine cabinet--a death trap? That sounds strange. The stuff inside it is supposed to cure you. It's not supposed to kill you.